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Effect of Advertising and R&D Expenditures on Global Brand Value

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Abstract

With the dawn of globalization, brand value weakness has been a growing concern for Japanese firms. Japanese firms must increase their brand value effectiveness to survive global competition in the future. This study analyzes the characteristics between Japanese and U.S. firms that acquire brand value with those that do not using advertising and Research and Development (R&D) expenditures. This study then indicates the varying tendencies between Japanese and U.S. firms in the each group using discriminant analysis. Through specific implications using financial data and analysis, this study explores current conditions and discusses implications for future study.

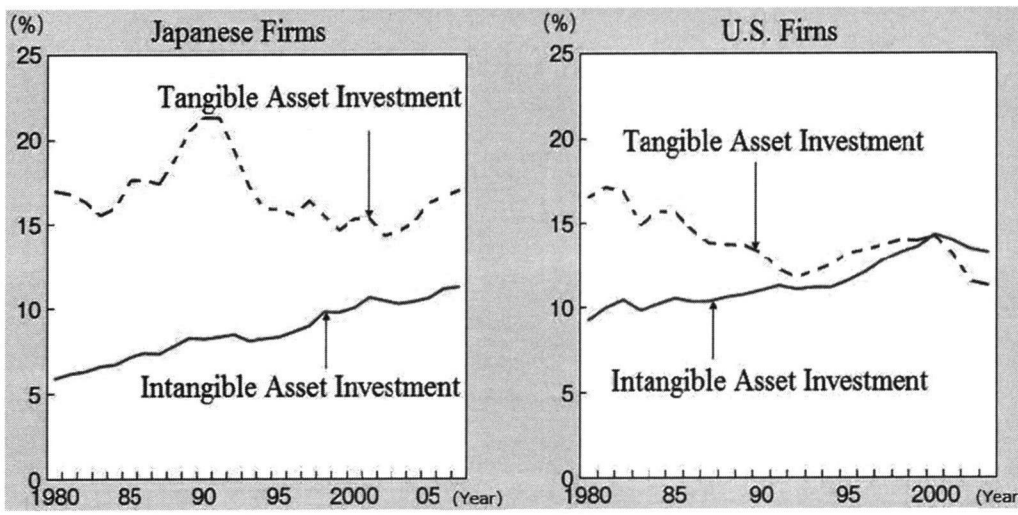
Keywords: *Intangible Assets; Global Brand; Brand Value; Advertising Expenditure; R&D Expenditure.*

I. Introduction

Recognized as a firm's most important asset, Intangible assets are those that are acquired through firms activities built through factors such as research and development (R&D), improvement of management organization, patent and trademark registration, and brand building. In the global economy, firms are likely to manage and improve intangible assets, because an increase in the overseas sales of firms, results in more intangible assets evaluated by markets. The analysis of cabinet office, Government of Japan (2011), verifies this fact using "Tobin-q." U.S. firms have invested more in intangible assets than in tangible assets

since 2000 (Figure 1); Japanese firms have also witnessed an increase in the percentage of investment in intangible assets; however, the percentage of investment in tangible assets continues to be higher.

Figure 1. Trends in tangible and intangible asset investment (private firms)



Source: Cabinet office, Government of Japan (2011), p.187.

This study focuses on brand value as an important intangible asset. Many Japanese firms have failed to increase brand value because they have not aggressively invested in intangible assets, compared to U.S. firms. According to "Best Global Brands 2011" by Interbrand Inc., in terms of high brand value, 7% of the 100 top ranked firms were Japanese, while 53% were U.S. firms (the largest group). "Global 500" by Brand Finance Inc., reported that 10 % of ranked firms were Japanese, while 34 % were U.S. firms (the largest group). This study highlights the investing tendencies between firms with high brand value and those with low brand value using financial data analysis that represents intangible asset investment. Furthermore, this study analyzes the differences between Japanese and U.S. firms in each group, and shows specific implications using financial data. This study seeks to provide improvement measures on acquiring brand value.

II. Brand Value and Investment in Intangible Asset

Corrado et al. (2005) classified intangible assets into three groups: *Computerized Information, Innovative Property,* and *Economic Competencies*. *Computerized Information* refers to knowledge associated with computer programs and computerized databases. *Innovative Property* includes patents, licenses, general know-how copyrights, and designs; these are represented by R&D expenditures. *Economic Competencies* is defined by brand value and other proprietary knowledge associated with firm-specific human and structural resources. According to the cabinet office, Government of Japan (2011), Japanese firms compared to those in other countries make substantial investments in *Innovative Property*. Their low rate of investment in *Economic Competencies* is perhaps the reason why many Japanese firms fail to acquire brand value.

Corrado et al. (2009) noted that advertising expenditures affect brand value (major component of *Economic Competencies*); This relationship has been discussed extensively in previous studies (e.g., Erickson and Jacobson, 1992; Keller, 1993; Herremans et al., 2000; Wang et al., 2009). Firms can strengthen their image and products in the market through advertising, thus aiding them in the enhancement of brand value. Ailawadi et al. (2003) suggest that brand value is created not only by advertising, but also by other marketing mixes, corporate image, product lines and R&D. Srivastava et al. (1998) state that brand value is created by advertising and superior product functionality. Simon and Sullivan (1993) noted R&D as an important factor influencing brand value, particularly in fields that regard technological innovation as important to consumers. Products and services provided by firms are recognized as means through which consumers can gauge the basic quality, functions, and specifications to consumers, thereby aiding the creation and enhancement of brand value. Because product innovation, improvement, and servicing are based on firm's R&D, it is also a factor of brand value creation.

Chu and Keh (2006) and Peterson and Jeong (2010) analyzed the relationship of brand value on advertising and R&D expenditures, concluding that both expenditures increase brand value. Interestingly, Chu and Keh (2006) indicated that R&D expenditures of up to $200 million increase brand value more positively and efficiently as compared with advertising expenditures; however, R&D expenditure of above $200 million result in minimal impacts on brand value. In contrast, advertising expenditure exceeding $200 million, results

in a significant increase in brand value.

According to Corrado et al. (2005, 2009), R&D expenditure was regarded as a component of *Innovative Property* and as a factor that did not affect brand value. As noted previously, however, R&D expenditure affects brand value. Therefore, the proposed hypotheses are as follows:

H1: High brand value firms make large investments in advertising expenditure compared with firms that have low brand value.

H2: High brand value firms make large investments in R&D expenditure compared with firms that have low brand value.

Two indicators -advertising and R&D expenditures- have been used to characterize multinational firms through product differentiation. Ghemawat (2007) and Caves (2007) noted that firms making significant R&D expenditures tend to differentiate products by physical aspects such as quality, function, and specifications, while those making large investments in advertising expenditures tend to differentiate products by invisible aspects, other than quality, function, and specifications, such as emotional value, status, and other factors.

Many Japanese multinational firms have differentiated their products by quality, function, and specification, and are regarded as global trademarks of high quality and advanced technology. Therefore, compared to firms in other countries, Japanese firms make significant R&D expenditures. This study compares Japanese and U.S. firms. The third hypothesis is as follows:

H3: Japanese firms invest significant amounts in R&D compared with U.S. firms.

III. Method and Data Collection

This study reveals the differences between firms acquiring high brand value and those that have low one using financial data (advertising and R&D expenditures). This study also analyzes the differences between Japanese and U.S. firms in each group. As noted previously, advertising and R&D expenditures are brand value creating factors; thus, advertising expenditure / net sales and R&D expenditure / net sales are calculated to facilitate comparison among firms. This study uses U.S. firms as a benchmark for Japanese firms because many U.S. firms have acquired global brand value.

This study uses *Discriminant analysis*, which is a method of statistical analysis that

explains the differences of groups (dependent variable) from multiple quantitative data (independent variable), and indicates the impact of the independent variable. In this study, advertising expenditure / net sales and R&D / net sales are assigned as the independent variables. Acquiring high brand value or low one, and Japanese or U.S. firms are assigned as the dependent variables. This study utilized six steps to obtain sample data from firms.

Step 1: Firms publishing revenue, advertising and R&D expenditures, as well as firms with an overseas sales ratio of over 30% during 2011 were identified. Japanese firms with an overseas sales ratio of over 30% in 2011 and Japanese firms' financial data were extracted from the *eol* database and *NIKKEI NEEDS Financial Quest 2.0* database, respectively. U.S. firms with an overseas sales ratio of over 30% in 2011 and U.S. firms' financial data were extracted from *Mergent Online database*.

Step 2: This study differentiated between firms acquiring high brand value with those that acquiring low one in 2011. I selected Japanese and U.S. firms ranked among the top 100 in "Best Global Brands 100 (2011)" by Interbrand Inc., and among the top 500 in "Global 500 (2011)" by Brand Finance Inc. as high brand value firms.

Step 3: In the sample (taken Step 1-2), some firms had much higher advertising / net sales and R&D / net sales ratios; however, these firms constituted generally smaller revenues and were considered "outliers"; thus, a long term trend analysis was not possible. Therefore, Japanese firms with revenue under 10 billion yen in 2011 and U.S. firms with revenue under 100 million U.S. dollars in 2011 were eliminated.

Step 4: To break down industry of sample, the Industrial Classification code *by Financial Services Agency, Japanese government,* was used for Japanese firms; and the SIC (Standard Industrial Classification Code) by *United States Department of Labor* was used for U.S. firms. Therefore, this study's sample constituted mainly firms from the manufacturing industry (machinery and appliance manufactures were most massive). R&D intensive industries were eliminated from this sample because they were incomparable with manufacturing industries such as pharmaceutical, medical equipment, optical instruments, and railroad instrument manufacturers.

Step 5: This study used 2010 financial data. As noted in Step 2, the group with firms having high brand value was used in 2011. This study assumed that advertising and R&D expenditures affecting brand value occurred prior to 2010.

Step 6: Distribution of advertising / net sales and R&D / net sales were lognormal

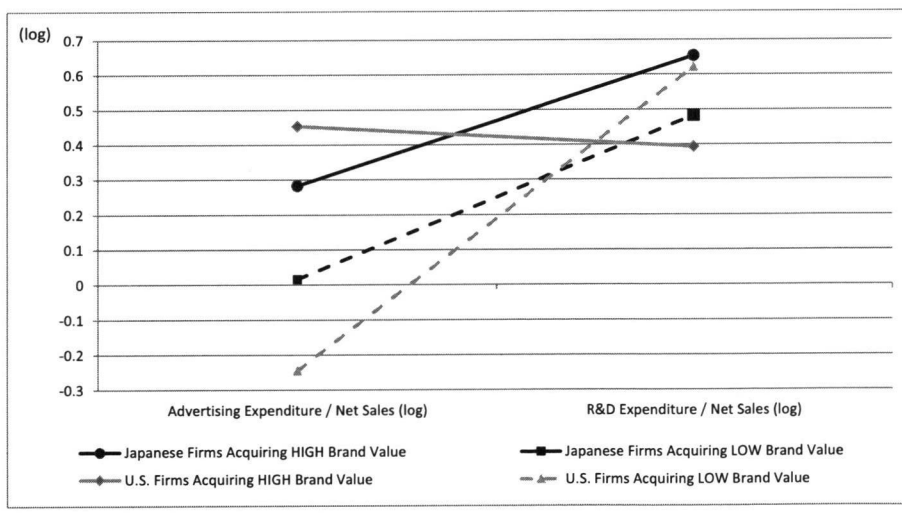
distributions. To use linear statistical analysis, normal distribution was used. Lognormal distributions were converted into normal distribution by logarithmic transformation; therefore, this study used advertising / net sales (log) and R&D / net sales (log). Any data point over 1.5 interquartile ranges (IQRs) below the first quartile or above the third quartile was defined as an "outlier" and eliminated from samples.

--Utilizing the above six steps, this study examined 607 samples from the manufacturing industry (Japanese firms: 362, U.S. firms: 245), which contain 392 samples among machinery and appliance manufacturers (Japanese firms: 244, U.S. firms: 148).

IV. Results

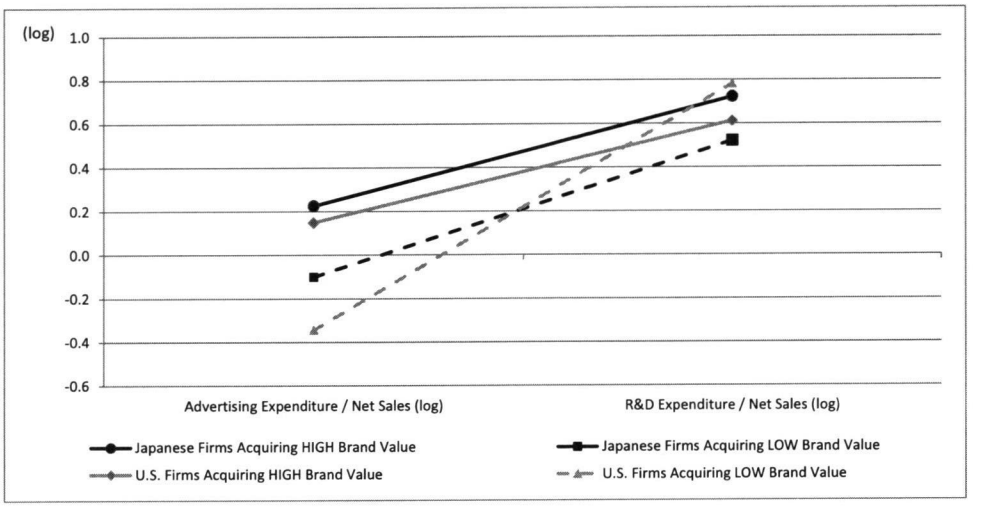
Averages of advertising expenditure/net sales (log) and R&D expenditure / net sales (log) are shown in Figure 2 (manufacturing industry) and Figure 3 (machinery and appliance manufacturers).

Figure 2. Averages of Advertising and R&D Expenditures (manufacturing industry)



Source: author. Note: Missing values were eliminated.

Figure 3. Averages of Advertising and R&D Expenditures (machinery and appliance manufacturers)



Source: author. Note: Missing values were eliminated.

1. Brand Value Acquisition among Groups

This study analyzed the difference between the groups that acquire high brand value with those that acquire low one using t-test. As a result, advertising expenditure / net sales (log) of the group acquiring high brand value was higher than that of the other group in the manufacturing industry (t (101.66) = 8.28, $p < .01$), and machinery and appliance manufacturers (t (184) = 4.00, $p < .01$). Conversely, the difference of R&D expenditure / net sales (log) between groups that acquiring high brand value and those that acquire low one could not be confirmed (manufacturing industry: t (575) = 1.24, *n.s.*; machinery and appliance manufacturers: t (58.88) = 0.63, *n.s.*).

This study analyzed the impact of advertising expenditure / net sales (log) and R&D expenditure / net sales (log) on brand value using discriminant analysis. Advertising expenditure / net sales (log) and R&D / net sales (log) were assigned to the independent variable. Acquisition of high brand value was the dependent variable.

Table 1. Discriminant analysis between groups based on brand value acquisition

Functions at Group Centroids

	Manufacturing Industry	Machinery and Appliance Manufacturers
Firms Acquiring HIGH Brand Value	0.795	0.771
Firms Acquiring LOW Brand Value	-0.150	-0.115

Standardized Canonical Discriminant Function Coefficients

	Manufacturing Industry	Machinery and Appliance Manufacturers
Advertising Expenditure / Net Sales (log)	0.947	0.982
R&D Expenditure / Net Sales (log)	-0.184	-0.123
Classification Accuracy	83.1%	87.0%

Source: author. Note: the size of each group was determined by estimating the prior probability from the sample size.

As a result, Wilk's lambda was statistically significant and the groups acquiring high or low brand value were classified statistically (manufacturing industry: $p < .01$, machinery and appliance manufacturers: $p < .01$). Functions at group centroids were as follows: the group acquiring high brand value was positive, while the group acquiring low brand value was negative in the manufacturing industry like machinery and appliance manufacturers (see Table 1).

In the standardized canonical discriminant function coefficients, advertising expenditure / net sales (log) was positive and R&D expenditure / net sales (log) was negative for the manufacturing industry, and machinery and appliance manufacturers. To the extent that advertising expenditure / net sales (log) was high and R&D / net sales (log) was low, firms increased brand value, and vice versa. In terms of impact, R&D / net sales (log) was marginally higher than advertising expenditure / net sales (log). Classification accuracy was 83.1% (manufacturing industry) and 87.0% (machinery and appliance manufacturers). Based on these results, H1 is supported and H2 is rejected.

2. Japanese and U.S. Firms

This study also analyzed the difference between Japanese and U.S. firms using discriminant analysis. Advertising expenditure / net sales (log) and R&D expenditure / net sales (log) were assigned as the independent variable, while Japanese or U.S. firms were the

dependent variables.

(1) Brand Value Acquisition among Japanese and U.S. Firms

For the manufacturing industry, Wilk's lambda was statistically significant: Japanese and U.S. firms were classified statistically ($p < .05$), but for machinery and appliance manufacturers, Wilk's lambda was statistically insignificant ($p = n.s.$). Therefore, the following results reflect the manufacturing industry. Functions at group centroids were positive for Japanese firms and negative for U.S. firms (see Table 2).

Table 2. Discriminant analysis among Japanese and U.S. firms on acquiring HIGH brand value

Functions at Group Centroids

	Manufacturing Industry	Machinery and Appliance Manufacturers
Japanese Firms	0.602	*n.s.*
U.S. Firms	-0.312	*n.s.*

Standardized Canonical Discriminant Function Coefficients

	Manufacturing Industry	Machinery and Appliance Manufacturers
Advertising Expenditure / Net Sales (log)	0.118	*n.s.*
R&D Expenditure / Net Sales (log)	1.030	*n.s.*
Classification Accuracy	63.6%	*n.s.*

Source: author. Note: the size of each group was considered by estimating the prior probability from sample size.

In the standardized canonical discriminant function coefficients, advertising expenditure / net sales (log) and R&D expenditure / net sales (log) were positive. This indicated that Japanese firms acquiring high brand value tend to invest more in advertising expenditure / net sales (log) and R&D / net sales (log) than U.S. firms. In terms of impact, advertising expenditure / net sales (log) was not as strong, although, the impact of R&D expenditure / net sales (log) was significant. Classification accuracy was 63.6%. From these results, H3 is supported for the group acquiring high brand value.

(2) Japanese and U.S. Firms Acquiring Low Brand Value

Wilk's lambda was statistically significant: Japanese and U.S. firms were classified statistically (manufacturing industry: $p < .01$, machinery and appliance manufacturers: $p <$

.01). Functions at group centroids indicated that Japanese firms were positive, while U.S. firms were negative in the manufacturing industry, and among machinery and appliance manufacturers (see Table 3).

Table 3. Discriminant analysis among Japanese and U.S. firms on acquiring LOW brand value

Functions at Group Centroids

	Manufacturing Industry	Machinery and Appliance Manufacturers
Japanese Firms	0.318	0.376
U.S. Firms	-0.130	-0.160

Standardized Canonical Discriminant Function Coefficients

	Manufacturing Industry	Machinery and Appliance Manufacturers
Advertising Expenditure / Net Sales (log)	0.992	0.846
R&D Expenditure / Net Sales (log)	-0.041	-0.475
Classification Accuracy	69.2%	68.3%

Source: author. Note: the size of each group was considered by estimating the prior probability from sample size.

In the standardized canonical discriminant function coefficients, advertising expenditure / net sales (log) was positive and R&D expenditure / net sales (log) was negative in the manufacturing industry, and among machinery and appliance manufacturers. Therefore, Japanese firms acquiring low brand value tend to invest in more advertising expenditure / net sales (log) and less R&D / net sales (log) than their U.S. counterparts. In terms of impact, advertising expenditure / net sales (log) was positive. Classification accuracy was 69.1 % (manufacturing industry), and 68.3 % (machinery and appliance manufacturers). From these results, H3 is rejected for the group acquiring low brand value.

V. Discussion and Conclusion

As noted previously, advertising expenditure and R&D expenditure were brand value creating factors. This study, however, verified that the group acquiring high brand value invested in less R&D than the group acquiring low brand value, and that H2 was rejected. This study is in tandem with previous studies which state that R&D expenditure creates brand value. For example, Japanese firms acquiring high brand value make major R&D investments as shown in Figures 2 and 3.

Japanese firms acquiring high brand value make large investments in both R&D and advertising (Figures 2 and 3) as indicated in Table 2. Advertising expenditure / net sales (log) was negatively correlated with R&D / net sales (log) in all samples (r = –.231, $p < .01$), therefore, making it difficult for firms to invest in other factors such as advertising if they invest a significant portion in R&D. Firms acquiring low brand value placed too much emphasis on R&D expenditure, thus rendering advertising and R&D expenditures as unbalanced (Figures 2 and 3). It is essential that firms maintain a certain amount of advertising investment to ensure acquiring high brand value. The relationship between R&D expenditure and brand value needs further research.

Between Japanese and U.S. firms, different aspects were confirmed in the group acquiring high brand value and that acquiring low brand value. In the group acquiring high brand value, Japanese firms invested more in R&D than U.S. firms; Therefore, I verify that Japanese firms acquiring high brand value tend to differentiate products by their physical aspects such as quality, function, and specifications. In the group acquiring low brand value, Japanese firms invested more in advertising than U.S. firms. The analysis of cabinet office, Government of Japan (2011), indicates Japanese firms tend to invest larger amounts in R&D than firms in other countries and primarily in industries requiring extensive R&D. As indicated in Table 1, the group acquiring low brand value invested less in advertising than the group acquiring high brand value. Thus, Japanese firms acquiring low brand value need to invest more in advertising and maintain a certain amount of advertising investment.

Using selected financial data, this study makes specific suggestions to increase firms' brand value. This study highlights the firms' trends of acquiring high or low brand value, and thereby examines the difference between Japanese and U.S. firms.

Nevertheless, this study has three limitations: (i) clarify the relationship between year-to-year percentage change of advertising and R&D expenditures, and brand value; (ii) analyze the sample eliminated as an "outlier"; (iii) consider other brand value creating factors. These limitations will be examined in my future research.

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